Red Rock Canyon National Conservation Area
Environmental Education Program

Mojave Max Emergence

www.Mojavemax.com

Classroom Program

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January 2002
Revised 1/30/02

Grade Primary *(Secondary)*

Subject Desert Tortoise

Theme Mojave Max is a threatened species well adapted to the desert life who will soon come out of hibernation.

Goal To expose students to the desert tortoise, its natural history and how the students actions affect its existence.

Objective

1. Students will describe the weather in the Mojave
2. Students will observe how temperature affects the desert tortoise.
3. Students will identify at least two adaptations of the desert tortoise which enable the reptile to survive in desert conditions.
4. Students will identify at least one way they can help protect the desert tortoise.

Curriculum (CCSD CEF Standard met)

- Science
  - 8.0 Heredity and Diversity
  - 9.0 Evolution – Process of Biological Change over time
- Essential Concepts, Skills, and Experiences
  - Life Science 2.1, 2.2
  - Environmental Science 4.1, 4.2
  - Scientific Inquiry 6.1

Vocabulary

- **Adaptation** – a physical or behavioral feature of an animal or plant that helps it survive in its environment.
- **Aestivation** – a deep sleep that some animals enter to escape the summer heat, a hot weather version of hibernation.
- **Burrow** - a hole in the ground made by an animal.
- **Habitat** – a place where a plant or an animal lives in nature
- **Hibernation** – a deep sleep that some animals enter to escape the cold of winter.
- **Reptile** – an animal that is cold-blooded (exothermic) and can not regulate its body temperature internally. It is dependent on the environment around it.
- **Scute** – an external, bony plate found on the carapice (back) of the desert tortoise shell.

Background

Red Rock Canyon Conservation Message

Red Rock Canyon National Conservation Area represents some of the best geologic features, and unique plants and animals found in the Mojave Desert. The area provides scenic and recreational opportunities for hundreds of people each day, and it is a *safe haven* for wild plants and animals of the Mojave Desert.

The growth of the Las Vegas Valley has caused increased development, road construction, off-road vehicle travel, and the dumping of trash. Humans are largely responsible for the loss and degradation of desert tortoise habitat. It is important to manage these protected lands and realize how each persons actions impact the desert tortoise.

Red Rock Canyon, home of Mojave Max, has partnered with Clark County to bring a desert tortoise program to teachers and students. The Multiple Species Habitat Conservation Plan and its PIE committee sponsors a Mojave Max Emergence Contest and continuing education in the local schools

Background on Mojave Desert

The Mojave Desert is the hottest and driest desert in North America. Temperatures range from as high as 130 degrees in the summer to below freezing in the winter. The average yearly rainfall measures only four to six

inches and almost all of it is during the winter. At Red Rock Canyon, precipitation is close to 10 inches due to the snowfall in the winter months. The drying effects of the wind and the intense sunlight also contribute to the desert conditions.

Background the Desert Tortoise

The Desert Tortoise has made the Mojave Desert its home for thousand of years. How is a desert tortoise able to survive such harsh conditions? This animal has adapted in numerous ways – by hibernating in the winter months, aestivating in the heat of the day or season, by conserving water over long periods of time by retention in its bladder, by having sharp claws that allow them to dig underground burrows.

Tortoises are reptiles. Other reptiles include lizards and snakes and even dinosaurs. All reptiles have scaly skin, lay eggs, and are cold blooded. Cold-blooded, or exothermic (exto = "outside", thermic = "heat"), animals depend on heat from outside their bodies (unlike mammals and birds that generate their own heat), so they must rely on an external energy source (the sun) to keep them warm to survive. When you see a reptile basking in the sun they are not trying to get a suntan but warming their bodies.

Is a tortoise a turtle? Yes, but not all turtles are tortoises. When we think of turtles, the first thing that comes to mind is a turtle spending its time sun bathing next to a pond. But, there aren't many ponds in the desert and the tortoise doesn't know how to swim. The tortoise is a land dwelling turtle, and only goes to the water to drink. The desert tortoise is not green like most turtles, but a yellow-brownish color to blend in to the desert environment.

Its legs are built for a life of digging burrows and laying eggs in the dry, sandy soil. The forearms are scaly, muscular and flattened with thick, long toenails acting as tiny shovels for digging or a shield against predators.

All tortoises have shells. The desert tortoise has a characteristic dome-shaped shell that looks a lot like a butterball turkey with legs. The shell has three basic parts: the plastron on the underside, the carapace covering the back, and 13 scutes arranged in a pattern on the carapace.

Both the male and female have a gular horn located on the front of the plastron. The horn is longer in the male and often upturned. Males use these in fighting with other males during the mating season. If the male can

flip the other male on its back, then they will get the girl. The opponent attempts to stand as high as possible to prevent this from happening.

Hibernation / Aestivation

In Nevada, tortoises construct two types of burrows – summer burrow and winter dens. Temperature regulation is the main motive for tortoises to use a burrow.

Around October the temperatures begin to drop in the Mojave Desert. One way to escape the cool temperatures and to survive the winter with little or no food is to hibernate. The desert tortoise prepares for winter two ways, digging underground burrows and storing up body fat. The winter burrows are permanent dens the tortoise will return to every fall to hibernate. These burrows have a characteristic half-moon shape entrance and may be up to 30 feet deep. Each burrow maintains a relatively stable temperature throughout the year. During hibernation, several tortoises may occupy the same burrow. In the fall before entering the burrows to hibernate, the tortoise will eat extra nutrient rich foods. It is stored as body fat to be used later for energy.

While hibernating the tortoise is in a period of inactivity. The body temperature is lowered to match the air temperature of the burrow, about 40-60 degrees Fahrenheit. All body processes are slowed including the heart rate and respiration rate.

The summer burrow provides protection from the intense heat of the desert. The ground in the Mojave Desert can reach up to 140 degrees and since the tortoise cannot control its internal temperature it must find ways to keep from overheating. A tortoise might only be active above ground in the early mornings and late afternoons or evening. The rest of the day a tortoise will retreat to their summer burrows and aestivate. Aestivation, similar to hibernation, is only done during the hottest part of the day to conserve energy and water. The summer burrows are temporary and shallow. The tortoise will have a dozen or more scattered throughout its home range.

How do they know when to come out of hibernation?

It is impossible to predict exactly when the tortoise will come out of its burrow in the spring. There are three factors that tell the tortoise to emerge. The outside temperature is the first factor. Since tortoises are reptiles, they respond quite quickly to temperature change. As the weather gets warmer, so do their bodies, allowing them to begin to move. When the climate

temperatures permit the tortoise to move, they will walk out of their burrows. The length of the day is another factor. In the late winter each day gets longer, and the suns rays become more direct. The direct rays begin to warm the earth eventually reaching deep into the burrows. The third factor is the tortoise's internal clock, and the most important factor. It seems tortoises have a "clock" telling them to emerge one day regardless of the weather or length of day.

Bladder – tortoises can go long periods of time without water
A tortoise's bladder is capable of storing over a cup of water, to be reabsorbed by the body when water is scarce in the desert. Tortoises will drink from rain puddles, even constructing their own puddles by scraping shallow depressions in the soil to catch rain. Much of the water intake comes from moisture in the grasses and wildflowers they consume in the spring.

What they will do when they come out as a hatchling (life cycle)?
Hatchlings, baby tortoises hatch from eggs in late summer, approximately 80-120 days after being laid in early spring. They are less than two inches long and very vulnerable as the shell is pliable for the first five years of life. Approximately 1 hatchling out of every 15-20 nests reaches maturity. (Maturity does not occur until age 15 or older and they can live up to 50 – 100 years.)

Once the tortoise emerges from the shell they are independent and live solitary lives except during mating season. These herbivores eat grasses, blossoms, and succulent cactus flesh. Their simple metabolism allows them to go months without eating and drinking. They derive almost all of their water from consuming plants. As the spring plants dry out, the tortoise will eat some of the drying shrubs and grasses. Tortoises will eat the plants that are readily available.

Outline of Program

Today we are going to talk about the desert tortoise –

5 minutes – All grade levels
Introductions

5 minutes – All grade levels

Conservation Message/Partnership with Clark County

Choose from the following activities for the rest of your program.

5 minutes – All grade levels
The Native American Story – How Tortoise Flew South for the Winter.
Explain to the students that this is an Indian legend. This is how the Indians long ago made sense of how tortoises came to live in burrows.
Read story

5 minutes – 1st through 5th
Description of Life Cycle
Mojave Max's life all started when his mother used her large claws to dig a hole and laid several eggs (1-14 eggs) in the ground. Mojave Max's egg was only the size of a ping-pong ball (show ping-pong ball). Two to four month went by as Mojave grew big and strong inside his egg. Finally, Mojave was ready to face the outside world. He used his egg tooth to break out of his shell (show where egg tooth is located). He was starving after doing all of that work so he decided to munch down on the yolk sac found inside his egg. The size of the silver dollar, Mojave had to be careful since his shell is still soft (like a baby's head after birth) and his mother is not around to protect him.

How can a tortoise fit inside of a small, round shell?
Show Pokey-Mon toy and explain how the hatchling folds into the shell. Because of the soft flexibility of the shell, it can grow and fit into a circular shape even though it begins to harden once it emerges.
Then discuss the dangers of having a soft-shell for first 5 years.
A soft-shelled turtle make a great lunch for ravens, coyotes, bobcats, and badgers. It is known in the tortoise world only 1 to 5 out of every 100 hatchlings will survive to be an adult. If you do make it, a tortoise may live to be 60 to 100 years old. Eventually, Max's soft shell turned to bone and his shell is a great defense against predators while outside his burrow.
Range, habitat: Home range only .75 square miles, seem to have a good sense of compass direction and use local landmarks to find drinking sites, mineral licks, and food sources.

10 minutes – 1st through 5th

Become a Tortoise Activity
Ask for a volunteer student to come up and become the tortoise. Begin with the shell, or large aluminum pans, by placing the flat side in front. Why is the shell important to the Desert Tortoise? Explain the shape, each of the three parts, number of scutes, the color of the shell, and the use of the horn. To distinguish between males and females you have to look at the plastron. Females will have flat plastrons and males will have a concave (or dished) shaped plastron. Next, place the custom gloves on the student. Ask the students why would the tortoise need large, flat, scaly legs? What would the tortoise use the large claws for? Explain the different uses of the legs and claws, such as, digging burrows or laying eggs. If time allows, you could ask the student to move like a tortoise, SLOWLY.

10 minutes – 1st through 5th
Neighborhood discussion
Have students compare their neighborhood to the tortoise neighborhood /habitat
Ask the students to describe their neighborhood.
What do you find in a neighborhood? You are looking for answers like home, apartment, condo (shelter), grocery store (food), sinks, faucets, swimming pools (water) streets, sidewalks (animal paths, trails).

Ask the students if all neighborhoods are the same? Some have houses, some apartments, schools, stores, grocery stores, etc.

Well, in the desert we have neighborhoods as well. And the Desert Tortoise selects certain parts of the desert to live in. They are more comfortable in one neighborhood over another – they have a better chance of survival in a particular habitat.

Discuss habitat – food, water, shelter briefly

20–25 minutes – 3rd through 5th
Tinfoil Tortoise activity
This activity is an outside activity. Make sure you allow time in your program to move from the classroom to the activity area. The activity should be done in a relatively quiet area, so take the students to a corner of the schoolyard away from students at recess.

Split the class into five groups and give each group a tinfoil tortoise. Briefly explain to them their tinfoil tortoise represents how a real tortoise is affected by temperature. Direct the students to five different locations where each tinfoil tortoise will be placed, such as a grassy area in the shade, blacktop, on top of a piece of playground equipment, and a sunny, grassy area. Give the groups 2 minutes to find the best place to put their tortoises in the area you have selected for them. Select boundaries for the students to work in so you are able to control the group.

At the end of the two minutes, have them gather back at the meeting place for a 10-15 minute discussion. Discuss what makes a reptile a "reptile" and how the Desert Tortoise is able to survive in the Mojave Desert (burrows, hibernation, and aestivation). Explain the tortoise can function between the temperatures of approximately 68 degrees and the upper 90's.
What would happen if the tortoise gets too hot or cold? Also, they do not have legs like we do, so they are not able to elevate their bodies up off the hot desert floor. Humans have only the feet touching but tortoises have their whole lower body close to a very hot surface.

Allow the tinfoil tortoises to sit at least 10 minutes to warm up. Have one person from each group retrieve their tinfoil tortoise. While you are waiting, name off each area the tortoises are located and have the students raise their hands if they think that area will have the hottest tortoise. Feel each of the tortoises and rate them from hottest to coolest.
Ask them why certain tortoises were hotter than others? Did it have to do with the area they were in? You should be able to correlate between the temperatures of the tortoise with the area it was placed in (blacktop tortoise should be the hottest while the shade tortoise should be the coolest).

15 minutes – 2nd through 5th
Thermometer activity
Hold up the large thermometers and discuss with the students the different temperatures represented. One thermometer will indicate 40 degrees and one will indicate 100 degrees. What would the tortoise be doing at 40 degrees (hibernation) and what would they most likely be doing at 100 degrees (aestivation)? What about a temperature that was about 70 degrees very sluggish), 85 degrees (most active), and what about 95 degrees (slowing down and beginning to overheat – where's the shade)? If the tortoise gets to hot they panic and speed up. Then they could die from overheating.

Guess when Mojave Max will come out?

15 minutes – 6th through 12th

Jeopardy
Set these questions up in categories and have each group of 3-5 students try to answer the questions together. Then all groups will come together and compare answers – each question is worth points. The group with the most points wins "Jeopardy."

Answers	**Questions** What is/are	
Body		
The tortoise digs its home with this	Claws /Nails	100
The tortoise has 13 of these	Scutes	200
Used to flip other males over	Gular Horn	300
Name of a baby tortoise	Hatchling	400
Protective shell covering on tortoise	Carapace	500
Life History		
Animal with no internal body temp control	Reptile	100
Season Mojave Max will first appear	Spring	200
Life span of a tortoise	50-100 years	300
Season baby tortoise hatches	Late summer	400
The classification of the Desert Tortoise	Threatened species	500
Places		
The Desert Tortoise is this state's symbol	Nevada	100
The desert we share with the tortoise	Mojave Desert	200
The shelter a tortoise makes	Burrow	300
Area tortoise spends most of the day	Underground	400
Burrows that are permanent	Winter Burrows	500
Miscellaneous		
Animal covered with scales/shell	Desert Tortoise	100
What you do if you see a wild tortoise	Leave it alone	200
The Tortoise eat exclusively	Plants	300
Sleep animal enters during the winter months	Hibernation	400
Sleep animal enters during hottest part of day	Aestivation	500

10 minutes 6th through 12th
Survival Yesterday and Today
Ask the students how they survive in the cold of winter? They probably dress more warmly. In the heat of the summer? They wear light colored light-weight clothes, sun screen, hat, and drink plenty of water. How does the tortoise survive in the winter? Hibernation. In the heat of the summer? Aestivation.

If time permits discuss the Native Americans respect for the tortoise and the their uses of the shell, etc. so that they could survive in the desert of long ago.

2 minutes 1st through 5th
Tortoise Pledge
At the end of the program have the students recite the tortoise pledge. Hand the appropriate number of pledge cards to the teacher and explain he/she will pass them out later. Have everyone hold up their right hand (you may have to show them which hand) and repeat after you. They are now official tortoise patrol members.

Conclusion
Summarize adaptations and why hibernation is so important to Mojave Max. Also, what can the student do to protect the habitat of the desert tortoise. What would they do if they saw a tortoise in the wild? LEAVE IT ALONE. What would they do if they see one in the city? CALL TORTOISE ADOPTION HOT LINE. DON"T RETURN IT TO THE WILD.

Pre-site activity

1. Who Lives Here? from "Desert Tortoise Study Kit and Curriculum" Unit 2, page 22. Grades 1-2.
2. Reptile Advantage from "Desert Tortoise Study Kit and Curriculum" Unit three, page 4. Grades 1-3.
3. Desert Adaptation from "Desert Tortoise Study Kit and Curriculum" Unit one, page 30. Grades 3-6.
4. Adaptation Match from "Desert Tortoise Study Kit and Curriculum" Unit one, page 33. Grades 4-6
5. Desert Web of Life from "Desert Tortoise Study Kit and Curriculum" Unit two, page 27. Grades 6-8.

Post-site activity

1. Hand out picture of tortoise to be colored. Grades 1-3.
2. Hand out tortoise word search. Grades 1-6
3. Desert Tortoise Folk Tales from "Desert Tortoise Study Kit and Curriculum" Unit three, page 8. Grades 4-6.
4. Tortoise Ranges from "Desert Tortoise Study Kit and Curriculum" Unit two, page 18. Grades 7-12.